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# Xinlei Lin (Daisy)

Ph.D. candidate

personal website  
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I am a Ph.D. candidate in Neuroscience at New York University. I study the decision-making processes in both humans and artificial intelligence in complex environments. My thesis projects focus on improving deep reinforcement learning algorithms by integrating insights from human cognitive models, using large language models to predict behavioral patterns in gameplay, studying the latent factors and individual differences of human planning.

## EDUCATION

**Ph.D. candidate in Neuroscience**, *New York University* Graduating 2025.9  
**B.S/M.S in Biochemistry**, *University of California, San Diego* 2019.5

## SKILLS

**Tools and Languages** Python, TensorFlow, PyTorch, Unix, Matlab, Git, R, JavaScript  
**Research** Experiment Design with Human Subjects, Mathematical modeling, Deep learning, Reinforcement learning and planning, Large-scale high-Dimensional Data Analysis, Human behavior modelling

## RESEARCH EXPERIENCE

**Validating Model Metrics with Verbalization Data** 2023.10 — Present  
*Wei Ji Ma lab* *Center for Neural Science, NYU*

- Designed and conducted "think-out-loud" experiments to gather verbalization data from human subjects
- Analyzed verbalized thought processes to validate cognitive model metrics, enhancing model accuracy

**Learning How Humans Play Board Games With GPT Models (AAAI)** 2023.6 — Present  
*Wei Ji Ma lab + Acerbi lab* *Center for Neural Science and department of Computer Science, NYU*

- Trained GPT models on a dataset of 10M+ games to predict characteristics of human gameplay.

**Improve AlphaZero With Insights From Human Problem-Solving (paper, github)** 2021.4 — Present  
*Wei Ji Ma lab* *Center for Neural Science, NYU*

- Trained and applied Deep Reinforcement learning models (AlphaZero type agents) to solve planning tasks.
- Improved AlphaZero performance on puzzle solving by leveraging human features.

**Improve the Efficiency of A Log-Likelihood Estimation Method (github)** 2021.3 — present  
*Luigi Acerbi lab* *Department of Computer Science, University of Helsinki*

- Developed a dynamic resource-allocation method for unbiased log-likelihood estimation, reducing the variance of estimations

**The Latent Factors of Complex Planning (github)** 2020.10 — Present  
*Wei Ji Ma lab* *Center for Neural Science, NYU, NY*

- Developed a battery of 8 games to run a large-scale behavioral data collection online.
- Used dimensionality reduction techniques to investigate the individual differences and cognitive architecture of complex planning

**Decoding Population Activity Using Two-Photon Calcium Imaging** 2017.1 — 2019.6  
*Takaki Komiyama Lab* *UCSD*

- Conducted two-photon calcium imaging experiments on the cortical-striatal pathway to analyze and decode neural population activities, revealing key mechanisms of information segregation in motor behavior

## PUBLICATIONS AND CONFERENCES

X. Lin, B. Lake, W. Ma, **Understanding AlphaZero: Leveraging human features to enhance performance** (In preparation)

X. Lin, W. Ma, **The architecture of planning** (In preparation)

V. Yeom-Song, X. Lin, I. Kuperwajs, H. Schütt, W. Ma, L. Acerbi, **Learning how Humans Learn to Play Board Games with GPT-4IAR** (AAAI workshop 2024; FCAI AI Day 2023)

X. Lin\*, Z. Zheng\*, J. Topping\*, W. Ma, **Comparing Machine and human learning in a planning task of intermediate complexity** (Proceedings of the Annual Meeting of the Cognitive Science Society, 2022; The Multi-disciplinary Conference on Reinforcement Learning and Decision Making, 2022)

Gjoni E.\*, Sristi R.D.\*, Liu H.\*, Dror S., Lin, X., O'Neil, K., Arroyo O., Hong S.W., Blumenstock S., Lim B., Mishne G., and Komiyama T. **Dissection of inter-area interactions of motor circuits** (COSYNE 2023, 2022 Simons Collaboration for the Global Brain Annual Meeting, 2022 the Society for Neuroscience Annual Meeting)

## ACTIVITIES

Teaching Assistant for Brain and Behavior, NYU

2021.1-2021.5